

WHAT IS CLAIMED IS:

1. A method of processing an input object for pattern recognition comprising the steps of:
  - receiving an input object;
  - segmenting a target object from the input object to form a segmented target object;
  - performing at least one transform on the segmented target object to generate at least one transformed object; and
  - outputting the segmented target object and the at least one transformed object to at least one pattern recognizer.
2. The method of claim 1, wherein:
  - the target object represents an image of a person's face.
3. The method of claim 1, wherein:
  - the target object represents a handwritten character.
4. The method of claim 1, wherein:
  - the target object represents a biometric.
5. The method of claim 1, wherein:
  - the transform is a rotation transform.

6. The method of claim 1, wherein:  
the transform is a boundary shift transform.
7. The method of claim 1, wherein:  
the transform is an affine transformation.
8. The method of claim 1, wherein the outputting step comprises:  
outputting the segmented target object and the at least one transformed object to a single recognizer.
9. The method of claim 1, wherein the outputting step comprises:  
outputting the segmented target object and the at least one transformed object to a plurality of complementary recognizers.
10. The method of claim 1, wherein the outputting step comprises:  
outputting the segmented target object and the at least one transformed object to a plurality of substantially identically recognizers.

11. A method of processing an input object for pattern recognition comprising the steps of:

- receiving an input object;
- detecting a target object within the input object;
- segmenting the target object from the input object to form a plurality of segmented target objects; and
- outputting the segmented target objects to at least one pattern recognizer.

12. The method of claim 11, wherein the step of segmenting the target object from the input object to form a plurality of segmented target objects comprises:

- modifying the target object.

13. The method of claim 12, wherein the step of segmenting at least one target object to form a plurality of segmented target objects comprises:

- modifying a scale of the target object.

14. The method of claim 12, wherein the step of segmenting at least one target object to form a plurality of segmented target objects comprises:

- shifting at least one boundary surrounding the target object.

15. The method of claim 12, wherein the step of segmenting at least one target object to form a plurality of segmented target objects comprises:

- rotating the target object.

16. A method of aggregating a plurality of recognition results comprising the steps of:

receiving a segmented target object and at least one transform of the segmented target object;

performing at least one pattern recognition algorithm on the segmented target object and the at least one transform to generate a plurality of recognition results;

aggregating the plurality of recognition results to determine a recognition decision; and

outputting the recognition decision.

17. The method of claim 16, wherein aggregating the plurality of recognition results is according to an equation:

$$G_i(S_k(F_0(x)), \dots, S_k(F_N(x))) = \max S_k(F_n(x)) \text{ from } 0 \text{ to } N.$$

18. The method of claim 16, wherein aggregating the plurality of recognition results is according to an equation:

$$G_i(S_k(F_0(x)), \dots, S_k(F_N(x))) = (1/N) \sum S_k(F_n(x)) \text{ from } n = 0 \text{ to } N.$$

19. The method according to claim 16, wherein determining the recognition decision is according to an equation:

$$D(x) = j, \text{ if } G_j(S_j(F_0(x)), \dots, S_j(F_N(x))) = \arg \max_{1 \leq k \leq K} G_k(S_k(F_0(x)), \dots, S_k(F_n(x)))$$

20. The method of claim 16, wherein the performing step includes performing a plurality of complementary recognition algorithms.

21. The method of claim 16, wherein the performing step includes performing in parallel a plurality of substantially identical recognition algorithms.

22. A pattern recognition system comprising:

- an input to receive an input object;
- an object detector to detect a target object within the input object;
- at least one transform module to perform at least one transform on the target object to form a plurality of transformed objects;
- at least one pattern recognizer for generating a plurality of recognition results based on the target image and the plurality of transformed objects; and
- a recognition result aggregator for determining a recognition decision based on the plurality of recognition results.

0993663-032404

23. The system of claim 22, wherein:

the at least one transform module is a rotation transformer.

24. The system of claim 22, wherein:

the at least one transform module is a boundary shift transformer.

25. The system of claim 22, wherein:

a plurality of complementary pattern recognizers generate the plurality of recognition results.

26. The system of claim 22, wherein:

a plurality of substantially identical pattern recognizers operating in parallel generate the plurality of recognition results.

27. The system of claim 22, wherein the recognition result aggregator

aggregates the plurality of recognition results according to an equation:

$$G_i(S_k(F_0(x)), \dots, S_k(F_N(x))) = \max S_k(F_n(x)) \text{ from } 0 \text{ to } N.$$

28. The system of claim 22, wherein the recognition result aggregator

aggregates the plurality of recognition results according to an equation:

$$G_i(S_k(F_0(x)), \dots, S_k(F_N(x))) = (1/N) \sum S_k(F_n(x)) \text{ from } n = 0 \text{ to } N.$$



32. A pattern recognition apparatus comprising:

input means for receiving an input object;

transform means for performing at least one transform on the input object to generate at least one transformed object;

recognizer means for performing at least one pattern recognition algorithm on the input object and the at least one transformed object to generate a plurality of recognition results;

aggregating means for aggregating the plurality of recognition results to determine a recognition decision; and

decision output means for outputting the recognition decision.

33. An apparatus for processing an input object for pattern recognition comprising:

input means receiving an input object;

segmentation means for segmenting a target object from the input object to form a segmented target object;

transform means for performing at least one transform on the segmented target object to generate at least one transformed object; and

output means for outputting the segmented target object and the at least one transformed object to at least one pattern recognizer.



34. An apparatus for processing an input object for pattern recognition comprising:

input means for receiving an input object;

segmentation means for segmenting at least one target object from the input object to form a plurality of segmented target objects; and

output means for outputting the segmented target objects to at least one pattern recognizer.

35. An apparatus for aggregating a plurality of recognition results comprising:

means for receiving a segmented target object and at least one transform of the segmented target object;

means for performing at least one pattern recognition algorithm on the segmented target object and the at least one transform of the segmented target object to generate a plurality of recognition results;

means for aggregating the plurality of recognition results to determine a recognition decision; and

means for outputting the recognition decision.